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TREATMENT OF DISEASES OF THE PERIPHERAL ARTERIES

The treatment of peripheral arterial diseases has attracted more attention in the past ten years than ever before. There is not only a better recognition of vasospastic states but there is also an actual increase in frequency due to an increasing number of persons surviving to ages in which degenerative vascular diseases occur. The increase in the percentage of older persons in the population results from improvements in nutrition and general hygiene, industrial safety measures and particularly from a decrease in the incidence of infectious disease.

The symptoms of arterial insufficiency in the extremities are similar regardless of the etiology. Differences of symptoms are only helpful in differentiating an acute from a chronic disease.

General instructions to patients with vascular disease should be carefully given. Tobacco and self-medication are always forbidden in any form. Focal and general infections should be eradicated. The importance of thermal changes should be emphasized. Patients should seek a warm environment whenever possible. If this is not practicable they should dress warmly and avoid exposure to cold. Cleanliness of the affected members should be taught. Daily baths with bland soaps are important. Those who suffer from arterial insufficiency should be cautioned about placing their feet in front of fireplaces or open ovens and against stoves; nor should they use water bottles, hot electric pads or other uncontrolled devices.

Rest

It is axiomatic that an extremity getting insufficient arterial blood must be rested in proportion to the deficiency. Cases with severe closures must be rested completely; if this is not done, pain will be increased and trophic changes will be hurried in their development. Bruises of a minor character which would ordinarily be considered insignificant when complicating a vascular lesion, may result in ulceration and gangrene.

The position of the resting extremity is of great importance. Usually a perfectly horizontal position suffices, although some cases seem to maintain a better functional level with a slight elevation or depression of perhaps five degrees. The position is determined by the color of the extremity and the comfort of the patient. The affected member is usually best placed in cotton to prevent sheet burns and pressure sores. Doughnuts properly placed help to prevent pressure accidents. Bumping the extremity against the bed, the walls or against heat cradles may result in loss of a limb. Rest should be continued until the circulation has been reestablished.

After the circulation has been reestablished, it is important to begin exercises. These exercises should be kept within the asymptomatic tolerance limit. Passive exercises should be started early, followed by active movements.

Heat

Heat is important in treating cases of peripheral vascular disease, but it may be harmful when used improperly. Experimental work has shown that the most effective temperature is approximately 95° F. Temperatures above 100° may induce pain and cramps, and temperatures from 103° to 105° F. may cause a secondary spasm with resultant diminution of blood flow. Patients usually complain bitterly if the temperatures are much above 100° F.

A thermostatically controlled heat cradle has been found most efficient and practical. They can be made for home use without much expense. The cradle should be large enough to extend well over the chest and extremities of the patient. In acute and in the more severe chronic cases heat treatment should be carried out continuously.

Dry, radiant heat only should be used since moist heat produces tissue maceration and macerated tissues in a relatively avascular area become infected much more quickly than a dry and intact integument. It must be remembered that fluid evaporation from the skin results in cooling. Even hot wet dressings may therefore result in a lowering of surface temperature. Ultra-violet rays should not be used, and infra-red ray temperatures are quite difficult to control in many cases. In view of the real danger inherent in temperatures above 100° F., hyperthermia induced by diathermy and ultra short wave therapy may be very dangerous if used in subjects with grave arterial disease. The danger here lies in the inaccuracy of local and deep tissue temperatures.

Drugs

Drugs are used to produce vasodilation and to allay pain. Papaverine hydrochloride intravenously is commonly used because of its vasodilating powers. It does not work as well when given by mouth. The dosage commonly used is ¼ grain (0.065 G), repeated two or three times daily. As with other derivatives of opium, overdosage results in a depression of the respiratory rate.

Alcohol is an excellent vasodilator. It is usually given in the form of whiskey, in quantities sufficient to produce flushing. Sometimes it is necessary to keep a patient moderately inebriated for a period of several days. In the treatment of chronic vascular diseases or frequently recurring acute spasm, such as in Raynaud's disease, the use of alcohol is attended with the danger of causing addiction. In the treatment of older persons the danger is less.

The nitrites are efficient and well known vasodilators. Sodium nitrite and erythroltetranitrite are used occasionally but are so transient in their effects that they are hardly worth while. Furthermore, the untoward symptoms of dizziness, vertigo and fainting are so unpleasant that not many patients will use them for long periods.

Xanthine base derivatives are prescribed almost universally in vascular disease. "Theominal," Theobromin sodium salicylate, "Theocalcin," "Theamin" and "Glucophyllin" are a few of the compounds commonly used.

From personal experience, it seems that the xanthine compounds containing a sedative in the form of a barbiturate are the most helpful. Some workers have given "Theominal" intravenously with reports of good results. The general concensus of opinion is that this group is useful only as adjunctive therapy. Acetyl-beta-methylcholin has also been used with success in treating vasospasms. It is best given by iontophoresis, but can be given intramuscularly or subcutaneously. This drug is very toxic and must be administered very cautiously.

Typhoid vaccine therapy has been used almost continuously for about fifteen years. Originally given in doses as high as 400 to 500 millions intravenously, the beneficial effects seemed to be from the chill, temperature and nonspecific effects produced. More recently, smaller doses, up to only 20 millions, seem to be followed by equally beneficial results. Treatments are usually repeated every second or third day providing the patient has a normal temperature. Ordinarily twelve or eighteen injections constitute a series. If further treatment is indicated it is probably best to withhold the injections for a period of weeks before beginning the second series. Individual tolerance to typhoid shock therapy varies considerably in different individuals. It is advisable to have an electrocardiogram before starting shock therapy since deaths have resulted from coronary damage at the height of a chill. Typhoid therapy seems particularly effective in allaying rest pains.

Saline hypertonic solutions have recently been favorably advocated. They are given intravenously in amounts of from 100 to 300 cc. of a three to five per cent solution, repeated two or three times weekly for four to six weeks. Prolonged administration of such a hypertonic solution may result in red blood cell destruction and therefore the blood count must be watched.

One of the oldest methods of treatments for thrombo-angiitis obliterans was administration of isotonic solutions. Large quantities of physiologic saline and Ringer's solutions were popular. They are not used much now. Vitamin C deficiencies are being commonly found in association with blood vessel pathology. When these are present they should be corrected by diet or by the administration of large doses of synthetic vitamin C. Synthetic vitamins C (Cebione) are given in doses of 100 to 150 milligrams daily. Thyroid extract has been used in cases of thrombo-angiitis obliterans. These cases have been reported to have low basal metabolic rates and a low blood volume. Elevation of metabolic rates to normal is followed by an increase in the blood volume. The amount of thyroid extract required is, of course, an individual equation. One grain daily is used as a test dose. The dosage may be increased unless tremors, sweating, nervousness or pulse elevation appear. The basal metabolic rate should be checked frequently.

Tissue Extracts

Non-toxic insulin-free pancreatic extracts seem to be of great value in producing a vasodilatation. These extracts have the power of neutralizing ephedrine both in vivo and in vitro. Other similar extracts have been prepared from heart and skeletal muscle and seem to be equally efficient. Tissue extract should be given intramuscularly in doses of from 1 to 3 cc. It is temporarily quite painful if given subcutaneously.

Sedatives, other than those mentioned, must occasionally be resorted to. They should be used to secure rest and relieve pain. The same principles apply here as when sedatives are given for other diseases. Toxicity and addiction must be carefully guarded against in any chronic disease.

Antiseptics are occasionally needed in cases of ulceration and infection. The drugs used must have a low tissue toxicity. Dakin's solution and Azochloramid ointments seem to be quite effective. Mercurial, arsenical and toxic dye ointments should not be used.

Mechanical Treatments Used

The suction pressure apparatus has attracted most attention. This apparatus has been splendidly developed by Louis Herrmann. Alternating negative and positive pressure are applied to an extremity enclosed in a glass or cellulose acetate boot. These machines may be automatically controlled to secure a varying degree of suction or pressure. Usually a negative pressure of from 60 to 80 mm. of mercury and a positive pressure of from 20 to 40 mm. of mercury is used.

The length of time that the boot is used is dependent upon the severity of the case. A mild chronic deficiency may be benefited by one or two hours' treatment three times a week. A severe acute case may be best treated almost continuously. Care must be taken of the skin at the contact surface of the cuff and also in putting the extremity in and out of the boot.

The contraindications to this form of treatment are mainly infections and far advanced diseases. Any acute or chronic infection will be affected by this apparatus just as it would be by massage; therefore, superficial or deep infections and phlebitides are definite contraindications to its use. Moderately advanced and far advanced cases of arteriosclerosis derive great benefits from this therapy.

Intermittent venous occlusion, by means of a simple cuff to obstruct venous flow and produce a congestion has been advocated by Collins and Wilensky. This depends upon the production of a "Bier congestive hyperemia," and a "Lewis negative hyperemia" with release of congestion. Barsoum and Smirk have shown that tissues with circulatory arrest liberate a histamine-like substance. This substance may account for the marked reactive hyperemia produced by this method. This treatment is easily carried out by the patients. A simple blood pressure cuff, applied to the proximal end of the extremity, may be alternately inflated and deflated by the patient.

Oscillating beds, which alternately elevate the extremities and depress them, seem useful. This motion reproduces Buerger's original exercises. It has the advantage of being passively carried out, even while the patient is asleep. I believe it is a useful adjunct in treating vascular diseases, particularly for debilitated patients.

Acute embolic accidents are often amenable to surgery. Arteriotomy should probably be performed whenever possible. Other surgical treatments (except amputations) are based upon the presence of a high degree of spasm. They are all directed at the relief of spasm by a severance of vasoconstrictor nerves. Indications for surgery should be demonstrated by a release of spasm. This may be done by nerve block, general or spinal anesthesia. The histories of some cases suffice to indicate high spasticity. Periarterial sympathectomies, arteriectomies, and sympathetic ganglionectomies are some of the operations used. A discussion of these is not pertinent at this time.

Generally, collaterals develop best where the occlusion has been gradual. Acute accidental occlusions find the patients without collaterals and a loss of tissue is more common. Evaluation of therapy is difficult in almost all artificial cases because of a spontaneous tendency toward recovery.

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